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Medication reconciliation in in-patients with chronic pathologies: a narrative review

Abstract

Objective: To analyze the effectiveness of the medication reconciliation process by pharmacists at the hospital level in patients with chronic non-communicable diseases, evidenced through the analysis of readmissions and the acceptance of pharmaceutical interventions.

Method: A narrative bibliographic review was conducted in databases of the University of Concepción between 2011 and 2021. Keywords used in the search included medication reconciliation, hospital readmission, clinical pharmacy, discrepancy, among others. The search was conducted in both English and Spanish. Clinical studies, trials, descriptive observational studies, and analytical observational studies (case and control reports) were included, involving a population over 18 years old with chronic or non-communicable diseases and reconciliation at admission, during the stay, and at hospital discharge.

Results: A total of 36 articles were reviewed, of which only 23 compared the impact on unplanned readmissions within 30 days of hospital discharge, and 4 mentioned visits to the emergency department during the same period. Only 15 articles presented physician acceptance of interventions carried out by pharmacists during the medication reconciliation process, with an acceptance rate of at least 60%.

Conclusions: Based on this bibliographic review, it can be concluded that medication reconciliation has an impact on the quality of care. This is reflected in a reduction in both the number of visits to the emergency department and hospital readmissions during the 30 days following discharge.

Keywords: medication reconciliation, patient readmission, pharmacists, pharmaceutical interventions, discrepancies

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Introduction

In Chile, the Ministry of Health recognizes pharmaceutical services as activities carried out in both ambulatory and hospital care settings. These services are related to pharmaceutical care and pharmacovigilance, including medication reconciliation.[1]

Transitional care ensures continuity of care as patients move between different stages and settings of healthcare. Unintended medication discrepancies arising at care transitions have been reported as prevalent and are linked with adverse drug events (e.g. rehospitalisation).[2]

Medication reconciliation is defined as the formal process that involves obtaining a patient's comprehensive current medication list and comparing it to any medication they request or are being given at any healthcare stage, in order to identify and resolve any discrepancies according to the standards of medication frequency, route, dose, combination and therapeutic purpose.[3]

These discrepancies are consulted with the prescriber to assess their justification and correct them if necessary, and are subsequently documented for the patient and their healthcare provider. Reconciliation is a process that requires the participation of all professionals responsible for the patient, including nurses, physicians, pharmacists, as well as the patient and their caregivers.[4]

Medication reconciliation programs have proven to be a useful strategy in reducing medication errors related to healthcare transitions by 42-90% and reducing adverse events resulting from these errors by 15-18%.[3,5]

Unintentional discrepancies occur in approximately half of hospitalized patients upon hospital admission and persist to a similar extent at hospital discharge. Most importantly, medication errors at transitions of care can lead to patient harm.[6]

Medication reconciliation is crucial, especially at hospital discharge, as it ensures that the patient is well-informed about their new and existing medications. This information includes how and when takes the medications, which side effects require urgent medical attention, and highlights any new medications, discontinuations, and changes in dosage or formulation compared to the pre-admission medication.[7]

The process reduces the likelihood of patient hospital readmissions for the same reason as the initial admission. In the United States, many patients return to the emergency room due to medication-related problems, experiencing adverse effects associated with it, affecting 11 to 17% of patients between 4 and 6 weeks after hospital discharge.[8] Hospital readmissions are becoming frequent, increasing healthcare costs. Factors attributed to this situation include comorbidities, polypharmacy, and length of hospital stay.[9]

Despite medicine reconciliation being recognized as a key aspect of patient safety, there remains a lack of consensus and evidence about the most effective methods of implementing reconciliation and calls have been made to strengthen the evidence base prior to widespread adoption.[2]

A proper medication reconciliation for patients with chronic non-communicable diseases during their hospital stay and transitional care, to reduce medication errors, increase life expectancy and quality of life, and minimize healthcare costs and associated harms, is mandatory.

Pharmacists are the professionals best prepared to perform reconciliation due to their extensive knowledge of medications and their use in various diseases, enabling them to identify medication-related problems and selecting appropriate therapeutic alternatives for specific patients.

Therefore, the purpose of this work is to present a literature review that determines the pharmacist's involvement, through the analysis of readmissions and acceptance of pharmacist interventions based on the number of reported discrepancies, in the medication reconciliation process at the hospital level in patients with chronic non-communicable diseases.

Objective: To analyze the effectiveness of implementing a medication reconciliation process by pharmacists at the hospital level in patients with chronic non-communicable diseases.

Material and methods

A narrative literature review was conducted. To identify potentially relevant documents, the following bibliographic databases were searched from 2010 to 2021: Medline, Scielo, Google Scholar, Scopus, and Web of Science, provided by the University of Concepción. The keywords used in the search included: pharmaceutical reconciliation, Hospital readmission, clinical pharmacy service, discrepancy, internal medicine, medication reconciliation, adult, chronic disease, Pharmacy, medication error, hospital admitting, and 30 days. These keywords were used both in English and Spanish.

The selection criteria for the studies were as follows:

- Studies and clinical trials, descriptive and analytical observational studies.
- Patients over 18 years old with chronic pathologies or non-communicable diseases.
- Internal medicine, emergency, cardiology, respiratory, and endocrinology departments.
- Health centers of second and third level where the reconciliation process is carried out by a pharmacist or pharmacy students trained and supervised by a pharmacist.
- Papers in English and Spanish.
- Years 2010-2021.

Exclusion criteria involved studies with oncologic, HIV, and surgical patients, patients with mental disorders; reconciliation process conducted in outpatient pharmacies or inpatients discharged to nursing homes.

The analysis covered the reconciliation process performed by the pharmacist at different stages of care transition, including admission, hospital stay or inpatients transfers, and discharge, either collectively or separately. The main inpatients diseases, readmissions at 30 days, discrepancies found, and evaluation of pharmacist interventions were reported.

Regarding hospital readmission, it was considered if it was related to the same health problem as the admission. Also the pharmacist's influence on the process was evaluated by comparing the number of hospital readmissions between the control group (without pharmacist intervention) and the intervention group (with pharmacist intervention).

Finally, the consideration of pharmacist interventions by healthcare professionals (mainly prescribing physicians) was reported through the percentage of acceptance of these interventions at the time of medication reconciliation. This information was extracted from the selected documents when available.

All information obtained from the different articles was organized into tables to facilitate comparison. The statistical significance used was that provided by the original studies.

Results

Among the five search engines, 8741 potential documents were found. After applying the inclusion and exclusion criteria, 8593 articles were eliminated. Among these, 112 were repeated among the five databases, resulting in the review of 36 articles (Figure 1).

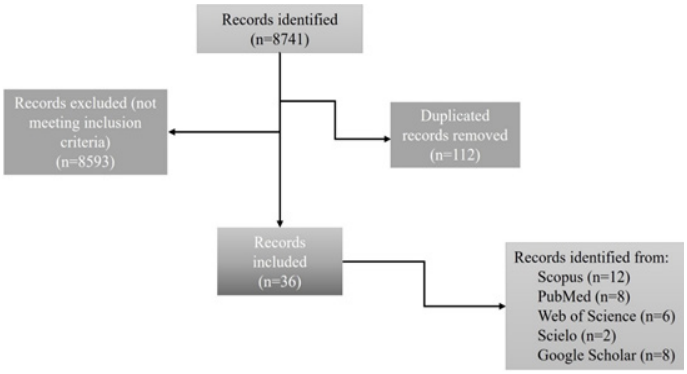

Figure 1 Diagram showing the selection of eligible studies for including in the review.

Regarding the types of studies, the most frequent were observational, including both prospective and retrospective analytical studies, conducted in medium to high-complexity tertiary hospitals. The studies focused primarily on internal medicine and cardiology, with particular emphasis on cardiovascular, respiratory, and endocrine diseases, such as type 2 diabetes mellitus.

The most studied population consisted of individuals over 55 years old, and in 28 studies, medication reconciliation was conducted at hospital discharge (Table 1).

Out of the 36 selected documents, only 23 compared the effect on unplanned readmissions within 30 days post- discharge. Four papers compared emergency department visits within 30 days post-discharge when medication reconciliation was performed by pharmacists or not, and only two articles reported on the cause of hospital readmission. Details are presented in Table 2.

In 15 articles, the acceptance of interventions performed by pharmacists during the reconciliation process was mentioned by physicians, and these interventions were accepted, reaching at least 60% (Table 3).

Table 1 Characterization of included studies in hospitalized patients with chronic non-communicable diseases, ordered by the transition of care assessed

Author, Year, Country	Study design	Length	Clinical areas	Diseases	N° of patients	Average of inpatients age	Transition of care assessed
Hellström et al.,[10]	Descriptive	10 months	IM	CV, DM, Resp	670	81	Admission
Lancaster et al.,[11]	Descriptive cross sectional	2 months	IM	CV	52	67	Admission
Mendes et al.,[12]	RCT	6 months	IM	CV, DM	136	53	Admission
Contreras Rey et al.,[13]	Observational, descriptive, retrospective study	6 months	IM, Cardiology, Pulmonology	CV, DM, GI, Resp	220	67	Admission
Pevnick et al.,[14]	RCT	1 month	Emergency	CV, DM, Resp	278	72	Admission
Lee et al.,[15]	Consecutive-cohort study	12 weeks	Geriatric	CV, Inf, Resp	372	83.2	Admission
Chiarelli et al.,[16]	Interventional prospective study	12 months	IM, Geriatric	CV, DM	90	82	Admission
Bell et al.,[17]	RCT	16 months	Cardiology	CV	851	60	Admission / Discharge
Casper et al.,[18]	Prospective, randomized, controlled study	25 months	Cardiology	CV	40	53	Admission / Discharge
Karapinar-Çarklt et al.,[19]	Prospective interrupted time-series study	20 months	IM	DM, GI, Inf, Renal	706	65	Admission / Discharge
Daliri et al.,[20]	Prospective cohort study	7 months	IM	CV, Resp, Neurological	197	73	Admission / Discharge
Wilkinson et al.,[21]	Prospective, cohort, nonrandomized trial	6 months	IM	CV, DM, Resp	229	57.4	Admission / Inpatient transfers / Discharge
Ravn-Nielsen et al.,[22]	RCT	25 months	Acute admission ward	DM, GI, Inf, Resp	1.467	72	Admission / Inpatient transfers / Discharge
Kripalani et al.,[23]	RCT	16 months	---	CV	851	60	Admission / Inpatient transfers / Discharge
Eggink et al.,[24]	Open randomized intervention study	14 months	Cardiology	CV	85	73	Discharge
Sánchez-Ulayar et al.,[25]	Experimental, controlled, randomized study	2 months	IM	CV, DM, GI, Resp	100	76	Discharge
Kilcup et al.,[26]	Ad hoc retrospective comparison	5 months	High risk patients Geriatric	CV, GI, Resp	494	67	Discharge
Luder et al.,[27]	Prospective, quasi-experimental study.	14 months	IM	CV, Resp	90	66.3	Discharge
Budiman et al.,[28]	Prospective study	3 months	Cardiology	CV	126	64.7	Discharge
Cavanaugh et al.,[29]	Retrospective observational study	7 months	IM	CV, DM, Resp	140	57	Discharge
Truong J et al,[30]	Retrospective, cohort study	16 months	Cardiology	CV	632	74.9	Discharge
Sawyer et al.,[31]	Prospective cohort study	1 month	Pulmonary unit	CV, GI, Resp, Neurological, Renal	118	63	Discharge
Rose et al.,[32]	Cluster RCT	36 months	Ambulatory	CV, DM, Resp	129	76.4	Discharge
Phatak et al.,[33]	Prospective, randomized, longitudinal study	1 year	IM	CV, GI, Inf, Resp	278	55	Discharge
Zemaitis et al.,[34]	Prospective, historical control study	6 months	IM	CV, DM, Resp	690	61	Discharge
Aniemeke et al.,[35]	Retrospective chart review	3 months	IM	CV, DM, Inf, Resp, Renal	89	53.1	Discharge

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Table 1 Continued...

Author, Year, Country	Study design	Length	Clinical areas	Diseases	N° of patients	Average of inpatients age	Transition of care assessed
Kovacik et al.,[36]	Retrospective chart review	9 months	Cardiology, respiratory	CV, Resp	104	70.6	Discharge
Neeman et al.,[37]	Prospective, interventional, interrupted time series analysis	7 months	IM	CV, DM, Resp	118	76	Discharge
Shanika et al.,[38]	Non-RCT	5 months	IM	CV, DM, GI, Resp	645	57.6	Discharge
Ip et al.,[39]	Prospective, non-randomized, quasi-experimental study	2 months	Urgencies	CV	85	81	Discharge
Cooper et al.,[40]	Retrospective cohort study	3 months	IM	CV, DM, Resp	203	62.1	Discharge
Shaver et al.,[41]	Retrospective records review	5 months	IM	CV	1219	64.3	Discharge
Oñatibia-Astibia et al.,[42]	Non-controlled before-and-after study.	1 year	A regional hospital and three primary care units	CV, DM, GI, Inf, Resp	143	72	Discharge
Boockvar et al.,[43]	Cluster-randomized trial	21 months	Geriatric	CV, DM, Inf, Resp	311	60	Inpatient transfers
Hohl et al.,[44]	Pragmatic prospective controlled quality improvement evaluation study	17 months	Emergency	Patients in risk of drug related problems	10807	70	Inpatient transfers / Discharge
Odeh et al.,[45]	RCT	12 months	Cardiology, Pulmonary unit	CV, Resp	62	67.4	Inpatient transfers / Discharge

CV: cardiovascular disease; DM: diabetes mellitus; GI: gastrointestinal disease; IM: internal medicine; Inf: Infectious diseases; RCT: randomized clinical trial; Resp: respiratory diseases; USA: United States of America

Table 2 Diseases, number of readmissions, and significance of pharmacist intervention in hospital readmissions within 30 days' post-discharge in selected documents

Author N° of participants	Diseases or patients included	Readmission (number or percentage according to authors	p[a]
Aniemeke et al.,[35] 89	Cardiovascular, Diabetes Mellitus, Infectious, Renal, Respiratory	3 days: Control: 6.7% Intervention:4.6%	1
		30 days: Control: 26.7% Intervention:18.2%,	0.45
Bell et al.,[17] 851	Cardiovascular	Decrease only in patients with low health literacy	0.94
Budiman et al.[28] 126	Cardiovascular	Control 13% Intervention 5%	0.18
Cavanaugh et al.[29] 140	Cardiovascular, Diabetes, Respiratory	Control 34.3% Intervention 14.3%	0.01
Hohl et al.[44] 10807	Patients with high risk of having a drug related problem.	Visits to Emergency Control: 310 Intervention: 414	0.88
		Readmissions: Control: 154 Intervention: 206	0.9
Ip et al.,[39] 85	Cardiovascular	Visit to Emergency (all causes: Control:47.6% Intervention: 25.6%	0.035
		Readmisiones a los 30 días: Intervención: 25.6% Control: 47.6%	0.48

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Table 2 Continued...

Author Nº of participants	Diseases or patients included	Readmission (number or percentage according to authors	p[a]
Karapinar-Çarklt et al.,[19] 706	Diabetes, Gastrointestinal, Infectious, Renal	Control: 27.3% Intervention 33.2%	0.2
Kilcup et al.,[26] 494	Cardiovascular, Gastrointestinal, Respiratory	7 days: intervention 2 control 11	0.01
		14 days: intervention 11 control 22	0.04
		30 days; intervention 28 control 34	0.29
Kovacik et al.,[36] 104	Cardiovascular, Respiratory	Control: 16.7% Intervention: 28.6%	0.23
Lee et al.,[15] 372	Cardiovascular, Infectious, Respiratory	Control: 28.8% Intervention 21.2 %	0.17
Luder et al.,[27] 90	Cardiovascular, Respiratory	Control: 32% Intervention: 7%	0.017
Neeman et al.,[37] 118	Cardiovascular, Diabetes, Respiratory	Control: 32% Intervention: 24%	No data
Odeh et al.,[45] 62	Cardiovascular, Respiratory	7 days: Control: 6,5% Intervención:0%	0.49
		14 days: Control: 12.9% Intervención:0%	0.45
Oñatibia-Astibia et al.,[42] 143	Cardiovascular, Diabetes, Gastrointestinal, Infectious, Respiratory,	Visits to Emergency: Before: 77 After: 65	0.405
		Readmission: Before: 41 After: 20	0.007
Phatak et al.,[33] 278	Cardiovascular, Gastrointestinal, Infectious, Respiratory	Visits to Emergency: Control: 21 Intervention: 6	0.001
		30 days readmission: Control: 34 Intervention: 28	0.43
		Drug related Control: 13 Intervention: 8	1
Ravn-Nielsen et al.,[22] 1467	Diabetes, Gastrointestinal, Infectious, Respiratory,	Visits to Emergency: Control (1: 22.3% Basic intervention (2: 19.9% Extended intervention (3: 14.3%	0.89 (1 and 2 0.62 (1 and 3
		Drug related readmission Control (1: 7.6% Basic intervention (2: 6.9% Extended intervention (3: 5.0%	0.9 (1 and 2 0.83 (1 and 3
Sánchez Ulayar et al.,[25] 100	Cardiovascular, Diabetes, Gastrointestinal, Respiratory	Control: 10 Intervention: 2	0.05
Sawyer et al.,[31] 118	Cardiovascular, Gastrointestinal, Neurological, Renal, Respiratory,	Control: 18% Intervention: 17%	No data
Shanika et al.,[38] 645	Cardiovascular, Diabetes, Gastrointestinal, Respiratory	Drug related Control: 29.9% Intervention: 13.2%	0.001
Shaver et al.,[41] 1219	Cardiovascular	All causes admissions: Control:16.86% Intervention: 6.54%	0.0001
		Disease related admissions Control: 13.30% Intervention: 3.59%	0.01

Table 2 Continued...

Author N° of participants	Diseases or patients included	Readmission (number or percentage according to authors	p[a]
Truong J et al.,[30] 632	Cardiovascular	Control 23.8% Intervention: 12.3%	0.005
Wilkinson et al.,[21] 229	Cardiovascular, Diabetes, Respiratory,	Control: 21.6% Intervention: 15.7%:	0.04
Zemaitis et al.,[34] 690	Cardiovascular, Diabetes, Respiratory	All causes admissions: Control: 24.7% Intervention: 18%	0.009

[a].p-values provided by each paper, and significant results were highlighted in bold.

Table 3 Acceptance of pharmacist interventions, according to the reported in each study

Author	N° of discrepancies	N° of interventions	Accepted interventions	Transition of care assessed
Chiarelli et al.,[16]	259	No data	Two-thirds	Admission
Contreras Rey et al.,[13]	361	312	29,80%	Admission
Hellström et al.,[10]	1139	813	567 (70%	Admission
Lee et al.,[15]	6,5 per patient	No data	100%	Admission
Mendes et al.,[12]	327	327	63,15%	Admission
Pevnick et al.,[14]	1016	1016	419 (41%	Admission
Casper et al.,[15]	17	138	96,20%	Admission / Discharge
Daliri et al.,[20]	916	916	65% admission; 26% discharge	Admission / Discharge
			46,7% post discharge	Admission y Discharge
Ravn-Nielsen et al.,[22]	No data	946	61%	Admission / Inpatient transfers / Discharge
Wilkinson et al.,[21]	313	No data	Yes (no numbers	Admission / Inpatient transfers / Discharge
Ip et al.,[39]	23	51	48 (91,70%	Discharge
Luder et al.,[27]	No data	7 per patient	46%	Discharge
Rose et al.,[32]	667	667	336 (54,9%	Discharge
Sawyer et al.,[31]	661 in control group 723 in intervention group	116	74 (63,7%	Discharge
Boockvar et al.,[43]	475	36	23 (64%	Inpatient transfers

Discussion

Based on the obtained results, pharmacist participation influences hospital readmissions, as evidenced by a decrease in both emergency department visits and readmissions within thirty days post-discharge. Statistically significant differences were shown in the studies by Luder et al., [27] Sánchez et al.,[25] Shanika et al.,[38] Shaver et al.,[41] Truong et al.,[30] Wilkinson et al.,[21] and Zemaitis et al.[34] Reducing patient readmissions not only allows for a decrease in emergency department congestion but also in inpatient bed occupancy. It was observed that the more comprehensive the reconciliation process (including higher staff training, more time allocated, more sources of information, and greater patient involvement), the greater the impact on reducing readmissions.

Regarding emergency department visits, differences in the decrease of visits were found in the intervention group compared to the control group in the studies of Hohl et al.,[44] Ip et al.,[39] Oñatibia-Astibia et al.,[42] Ravn-Nielsen et al.,[22] and Shaver et al.,[41] demonstrating the pharmacist's influence in this stage of medication reconciliation. However, in three documents, this difference was not statistically significant despite a notable reduction in the absolute number of results. Notably, four out of five documents were analytical observational studies, recording and describing obtained data, with only the study by Ravn-Nielsen et al.,[22] being experimental.

Concerning to readmissions, patients with cardiovascular pathologies had the highest rates, followed by those with respiratory conditions and type 2 diabetes mellitus, reflecting the focus of the analyzed studies and the established inclusion criteria.

The reviewed studies indicate a numerical decrease in hospital readmissions within thirty days' post-discharge in thirteen out of the twenty-three analyzed articles. However, this reduction did not reach statistical significance in most cases. This finding suggests the possibility that important factors, such as the underlying cause of readmissions, may not be adequately considered in the analysis.

Only the study by Ravn-Nielsen et al.,[22] compared readmissions caused by medications, while the study by Shaver et al.,[41] compared whether the cause of readmission was the same as the previous admission. Regarding the former, pharmacist involvement led to a reduction in readmissions caused by medications. Similarly, when evaluating the cause of readmission, a significant decrease in readmissions for the same reason (13% control versus 3% intervention) and for all causes (16% versus 6%, respectively) was reported.

The studies by Lee et al.,[15] and Pevnick et al.,[14] offer contrasting perspectives on the impact of pharmacist involvement in hospital stay. Lee et al. [15] found a significant decrease in the average hospital stay, from 18.5 days to 9.5 days, demonstrating significant resource savings for patients, hospitals, and the country. In contrast, the study

by Pevnick et al.,[14] showed an increase in the average stay with pharmacist intervention, with the usual care group (control) having a stay of 5.2 days, the pharmacist-led reconciliation group with 6.5 days, and the pharmacy technician-led reconciliation supervised by a pharmacist group with 6.2 days. Hence, further research is needed to better understand this variability.

About the acceptability of interventions, approximately half of the reviewed documents evaluated this variable, but no clear relationship was found between the acceptance of interventions and the moment they were conducted. Although these interventions were generally accepted, the lack of detailed data on which interventions were accepted or rejected prevents definitive conclusions from being drawn.

Some limitations of this work include the lack of uniformity in the selected studies, including the age of patients (over 55 years), limiting the understanding of experiences of younger patients. Additionally, there was a limited focus on medication reconciliation only at discharge or hospital admission, rather than considering all patient care transitions. Heterogeneity in sample sizes makes effective comparisons difficult, and lack of detailed information on reasons for hospital readmissions confounds analysis.

Furthermore, deficiencies in the studies related to factors that could hinder the medication reconciliation process were identified, such as the availability of pharmacists 24/7. The lack of studies in Latin America was also highlighted, as most of the reviewed articles came from the United States and Europe. Moreover, the review was limited to articles in Spanish and English, which may have excluded relevant research in other languages.

Conclusion

The literature review clearly demonstrates the significant impact of pharmacist-led medication reconciliation on the quality of care. This is evident from the reduction in readmissions and emergency department visits within thirty days post-hospital discharge, thereby alleviating emergency department congestion. Moreover, patients with cardiovascular, respiratory, and endocrine diseases, including type 2 diabetes mellitus (which was specifically studied in this work), benefited the most. The acceptability of pharmacist interventions was generally high, estimated to be over 50%, with particular emphasis at hospital discharge.

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None.

Conflicts of interest

The authors declare that they have no conflicts of interest.

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